

## Flexible, Low CTE Composites for Precision Deployable Structures

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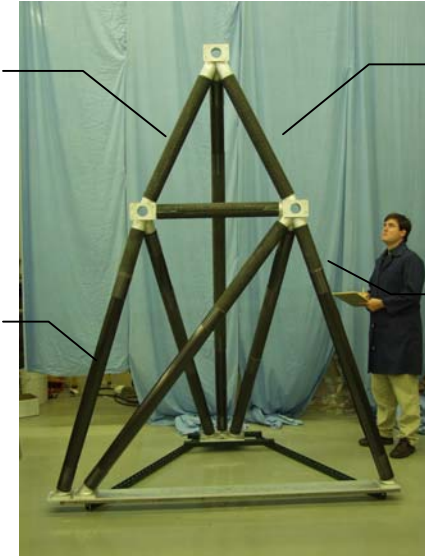
### Identification and Significance of Innovation

**Problem:** Strain energy based deployable structures have been shown to greatly increase deployed precision and dynamic stability as well as decrease launch mass and volume. However, these high stiffness, flexible materials also do not have the near-zero CTE required for the long observations of NGST or Terrestrial Planet Finder.

**Solution:** Foster-Miller, Kodak, and the Univ. of Colorado will develop flexible carbon fiber materials that have blended Boron fibers and proprietary resins to create highly thermally stable structures that will enable NASA's planned large deployed optical systems and reduce their launch mass and volume.

Composite structure provides stiff, stable, statically determinate support for a precision optic

Deployment hinges are flexible composites for stiffness, strength, and nanometer dynamic stability



Hinges are integrally part of the structure for lighter weight and reduce launch volume

Current materials are too thermally expansive to allow NASA to take full advantage of this innovation

### Technical Objectives and Work Plan

Technical Objectives:

1. Demonstrate the ability to design flexible composites for low CTE (0.05 ppm/°F)
2. Develop manufacturing techniques using high accuracy fiber placement with ultrasonics
3. Integrate the new material into a high precision Integral Folding Hinge

Work Plan:

Foster-Miller and Kodak will work together to develop the requirements and design of a low thermal expansion and low moisture absorption material that is flexible enough to be used in FMI's patented Integral Folding Hinge technology. FMI will fabricate coupons and hinges made of this material and the University of Colorado will test them for deployment repeatability, post deployment stability, precision and stiffness.

### NASA and Non-NASA Applications

NASA: Large deployed optics such as NGST, SIM and TPF. Large LIDAR, STAR and other high resolution science instruments.

Non-NASA: Communications antennae, DoD Reconnaissance mapping and surveillance instruments.

### Contacts

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